NASAL IRRIGATION – HIGHLIGHTED BIBLIOGRAPHY


This review provides an overview of the current guidelines and recent literature regarding the diagnosis, microbiology, and treatment options of chronic rhinosinusitis in the pediatric population. Nasal saline irrigation is recommended as a first-line treatment option, well supported in current literature.


Updated guideline that provides evidence-based recommendations to manage adult rhinosinusitis. Among others, the update group made recommendations, including that clinicians should suggest saline nasal irrigation, topical intranasal corticosteroids, or both for symptom relief of chronic rhinosinusitis.


Nasal showers are a first-choice treatment for both acute and chronic rhinosinusitis, in the absence or presence of nasal polyposis.


Xylitol has been shown to reduce nasal bacterial carriage, otitis media and cavities *in vivo*. Diluted in water, it is a well-tolerated agent for sinonasal irrigation, reducing more efficiently the symptoms of chronic rhinosinusitis compared to saline irrigation alone.


Systematic review analyzing randomized clinical trials, reviews and meta-analysis on therapies for managing adult rhinosinusitis. It concludes that evidence supports daily high-volume saline irrigation and topical corticosteroid therapy as a first-line therapy for chronic sinusitis.

Review of 14 studies including children and adults: Saline irrigation may reduce patient-reported disease severity compared with no saline irrigation at up to three months in both adults and children with allergic rhinitis, with no reported adverse effects.


This review describes beneficial effects and adverse events of various intranasal medications in treating rhinosinusitis, including intranasal steroids and nasal irrigation. No serious adverse events have been found for nasal irrigation.


A randomized clinical trial showing that nasal saline irrigation is beneficial for the treatment of asthma and allergic rhinitis in children.


This article provides a treatment algorithm (including nasal irrigation) for adults with chronic rhinosinusitis and nasal polyps, based on current guidelines and best available evidence.


This is a prospective randomized, blind, placebo-controlled trial, including 62 children with uncomplicated acute rhinosinusitis. Authors concluded that nasal saline irrigation (NSI) can be used alone with the same clinical and bacteriological efficacy and with higher safety profile than amoxicillin + NSI after 14 days of treatment.

In this study, including ninety-one pediatric patients with acute rhinosinusitis, low pressure nasal saline plus fluticasone propionate is faster than antibiotherapy and nasal decongestant in improving clinical symptoms.


Nasal irrigation is effective as a first-line treatment for pediatric chronic rhinosinusitis and subsequent nasal symptoms, and reduces the need for sinus surgery and tomography imaging.


Large-volume, low–positive pressure nasal irrigation with isotonic saline is an effective adjunctive therapy to improve quality of life in patients with allergic rhinitis already on intranasal corticosteroid therapy.


Nasal lavages with saline solution improve mucociliary clearance as measured by saccharin test. Temperature is relevant, with 37º C nasal lavages providing the highest benefit.


Postoperative lavage of the paranasal sinus is a recognized adjuvant in the treatment of chronic rhinosinusitis. It allows the association of topical medications that can be carried to the paranasal sinuses along with the saline, increasing the reach of these drugs. Among different options, it is preferable to use high-volume nasal irrigations through squeeze bottles.


Nasal irrigation improves symptom score after endoscopic sinus surgery in patients with chronic rhinosinusitis with nasal polyps.

In chronic rhinosinusitis disease, the use of corticosteroid delivered by nasal irrigation is superior to simple nasal spray in postsurgical patients.


93% of the children included in the study used nasal saline irrigation and reported symptomatic improvement. Only 28% of parents thought it would be a tolerated treatment by the child. As conclusion, the biggest obstacle to nasal irrigation in children is parents reluctance, showing that regardless of age, the children were judged by the parents.


Nasal irrigation performed with large volumes of irrigation fluid is more effective than pressurized sprays for the treatment of sinonasal symptoms.


Daily nasal irrigation for 6 weeks is safe and effective in the treatment of chronic pediatric rhinosinusitis. No differences were found between the use of saline solution alone or combined with gentamicin, and quality of life improved significantly after 3 weeks in both groups. The high tolerance, compliance and effectiveness of irrigation support its use as a first-line treatment for pediatric chronic rhinosinusitis before considering surgical intervention.


Devices and pharmaceutical agents to apply topical medical therapy to the sinuses are reviewed. Drug addition to large-volume, low-pressure nasal irrigation can be an effective option for the management of chronic rhinosinusitis.

Positive pressure nasal irrigation (SinuSalt) is more effective than nasal sprays or nebulizations to distribute the irrigation solution in the maxillary sinuses and in the frontal recess. This should be the method of choice for the irrigation of these areas.


Xylitol nasal irrigation results in greater improvement of symptoms in chronic rhinosinusitis and greater enhancement of nasal nitric oxide in maxillary sinus, as compared to saline nasal irrigation alone.


The irrigation with xylitol generates a great improvement of chronic rhinosinusitis symptoms in comparison with saline irrigation alone.

**NASAL IRRIGATION**

1. **Sinusitis/Rhinosinusitis**


This review provides an overview of the current guidelines and recent literature regarding the diagnosis, microbiology, and treatment options of chronic rhinosinusitis in the pediatric population. Nasal saline irrigation is recommended as a first-line treatment option, well supported in current literature.


This article provides a treatment algorithm (including nasal irrigation) for adults with chronic rhinosinusitis and nasal polyps, based on current guidelines and best available evidence.

Nasal saline irrigation may provide benefit for acute rhinosinusitis in children. Additional studies are needed to quantify the efficacy of this therapy.


This review describes beneficial effects and adverse events of various intranasal medications in treating rhinosinusitis, including intranasal steroids and nasal irrigation. No serious adverse events have been found for nasal irrigation.


The standard treatment of pediatric acute bacterial rhinosinusitis is nasal irrigation and antibiotic use.


Key recommendations for practice in acute rhinosinusitis, including nasal saline irrigation for symptomatic treatment.


Systematic review analyzing randomized clinical trials, reviews and meta-analysis on therapies for managing adult rhinosinusitis. It concludes that evidence supports daily high-volume saline irrigation and topical corticosteroid therapy as a first-line therapy for chronic sinusitis.


Updated guideline that provides evidence-based recommendations to manage adult rhinosinusitis. Among others, the update group made recommendations, including that clinicians should suggest saline nasal irrigation, topical intranasal corticosteroids, or both for symptom relief of chronic rhinosinusitis.

The results of this pilot study suggest that nasal saline lavage may significantly alleviate chronic sinonasal symptoms and improve disease-specific quality of life in children with symptoms of chronic rhinosinusitis.


This is a prospective randomized, blind, placebo-controlled trial, including 62 children with uncomplicated acute rhinosinusitis. Authors concluded that nasal saline irrigation (NSI) can be used alone with the same clinical and bacteriological efficacy and with higher safety profile than amoxicillin + NSI after 14 days of treatment.


Nasal irrigation is an effective adjunctive treatment for acute sinusitis in atopic children.


This is a randomized, double-blind, controlled study including 80 children with acute sinusitis. High-dose amoxicillin with saline nasal irrigation relieved acute sinusitis symptoms faster but confers only a small global therapeutic benefit over nasal irrigation alone.


Nasal irrigation is effective as a first-line treatment for pediatric chronic rhinosinusitis and subsequent nasal symptoms, and reduces the need for sinus surgery and tomography imaging.


This evidence-based review recommends sinonasal saline irrigation and standard topical nasal steroid therapy in the treatment of chronic rhinosinusitis, but is against the use of topical antifungal or antibiotic therapy using nebulized and spray techniques.

Nasal saline irrigation is one of the mainstays of an efficient treatment for chronic rhinosinusitis.


Saline irrigation may improve sinonasal disease symptoms, together with outcomes in certain contexts. Moreover, the use of xylitol in chronic rhinosinusitis provides promising results.


Saline irrigation is beneficial for the treatment of chronic rhinosinusitis symptoms.


Nasal saline irrigation improves the quality of life in pediatric rhinoconjunctivitis and is effective as a concomitant treatment in acute sinusitis in atopic children.


Nasal saline irrigation is an effective adjuvant treatment for chronic rhinosinusitis.


Daily nasal irrigation for 6 weeks is safe and effective in the treatment of chronic pediatric rhinosinusitis. No differences were found between the use of saline solution alone or combined with gentamicin, and quality of life improved significantly after 3 weeks in both groups. The high tolerance, compliance and effectiveness of irrigation support its use as a first-line treatment for pediatric chronic rhinosinusitis before considering surgical intervention.

Nasal irrigation is a first-line treatment for chronic rhinosinusitis, together or not with nasal polyposis.


Nasal showers are a first-choice treatment for both acute and chronic rhinosinusitis, in the absence or presence of nasal polyposis.


Daily nasal irrigation improves the symptoms and quality of life of patients with chronic rhinosinusitis.


Systematic review of all clinical studies published in the literature (1950-2006) according to the Cochrane method. It is concluded that nasal irrigation is well-tolerated and beneficial. Its application in the treatment of chronic rhinosinusitis is suggested.


Nasal irrigation is an adjuvant treatment for sinusitis in children.


Nasal irrigation is a safe, effective and economical treatment for the chronic treatment of sinonasal diseases.


Nasal irrigation is safe and effective. It may decrease the use of nasal antibiotics and decongestants, being useful for the treatment of rhinosinusitis.

Nasal irrigation together with antimicrobial agents is a potential effective treatment for the increasing group of patients who remain symptomatic after appropriate medical and surgical treatment.


This is a study in 54 patients with chronic sinusitis where it is demonstrated that both quality of life and symptoms improve significantly upon regular nasal irrigation.


Review on the treatment of chronic sinusitis in pediatrics. Nasal irrigation is an adjuvant treatment that is especially effective.


Nasal irrigation with a saline solution along with nasal steroids are the basis of the treatment of chronic sinusitis.


Nasal irrigation with saline solutions cannot be considered as a mere adjunctive treatment of rhinosinusitis any longer. Despite being effective and safe, it is underutilized.


Saline irrigation improves breathing and lengthens the time between relapses.

Saline irrigation is a first-line treatment for acute sinusitis.


Different treatments of acute bacterial rhinosinusitis are reviewed. Regarding nasal irrigation, authors conclude that nasal irrigation is beneficial without causing adverse effects.


Saline irrigation is recommended for the treatment of pregnancy rhinitis in place of nasal decongestants, that should be avoided.


Postnasal drip, nasal congestion and nighttime coughing in children with chronic sinusitis associated with mild asthma are improved just with saline irrigation.


Nasal irrigation is a simple and inexpensive treatment that improves the symptoms of a variety of sinonasal diseases, reducing the use of resources and minimizing resistance to antibiotics.


Daily saline irrigation improves the quality of life of patients with sinusitis, decreasing symptoms and medication uptake.

Nasal irrigation improves the symptoms of sinusitis in 70% of the patients studied, reducing the need for medication consumption in 50% of them.


The use of saline irrigation in chronic sinusitis treatment protocols is emphasized.


Nasal irrigation is very effective in improving the symptoms and health of sinonasal disease patients.


Nasal irrigation with isotonic saline solution is effective for the treatment of chronic sinusitis.


Nasal irrigation improves the endoscopic image of the nasal mucosa and the quality of life of patients with chronic rhinosinusitis, while remaining unchanged in the control group (without irrigation).


Saline irrigation is a non-pharmacological treatment that is recommended for the treatment of sinusitis.


Saline irrigation is a particularly effective strategy for sinusitis treatment. If done regularly, it is so effective in eliminating nasal obstruction that some patients with chronic or persistent sinusitis do not need any pharmacological treatment.

Sinonasal irrigation alone prevented the need for surgery in 58% of patients with chronic sinusitis for one year.


Daily cleaning of the nasal and sinus pits by saline irrigation is important for the prevention of infections in patients with cystic fibrosis.


Saline irrigation is recommended as an effective treatment for sinusitis, supplementary to other therapeutic modalities.


Saline irrigation on a regular basis is one of the most effective methods to reduce mucosal edema. If nasal steroids are used, they are more effective if they are administered on the mucosa that has been cleansed and decongested previously with saline irrigation.


Saline irrigation is very effective for the management of allergic and infectious rhinitis. The main benefits of saline irrigation include: 1. Increase of mucociliary flow 2. Dilution of thick secretions 3. Relief of irritated mucosa 4. Elimination of crusts and foreign bodies 5. Facilitated healing of mucous membranes 6. Reduction of the need to blow 7. Improvement of smell.


The Grossan nasal irrigator coupled to the WaterPik has increased the efficiency of nasal saline showers.

Without need for drug consumption, saline irrigation is able to eliminate pus, allowing a disease recovery in a natural and non-aggressive way.


Part of the radiographic material placed in the nostrils before bedtime could be detected in the tracheobronchial tree the morning after. This might explain why sinus secretions cause infections in the lower airways, including bronchitis and bronchospasm. Hence, the great value of saline irrigation is to eliminate infectious secretions in the upper respiratory tract, thus preventing its spread.


Emphasis is placed on the use of saline irrigation for regular treatment at home. Authors recommend the addition of antibiotics for the irrigation of the sinuses.


Cystic fibrosis is frequently associated with sinusitis because of poor functioning of the mucociliary system. Pulsed saline irrigation is recommended to clean the sinuses, improving mucociliary function and decreasing the viscosity of secretions.

**Prospects for Ancillary Treatment of Sinusitis in the 1990s.** Zeiger RS. *Journal of Allergy and Clinical Immunology* (1994), 90:478.

Saline irrigation improves mucociliary clearance and decreases mucus viscosity.


In addition to the administration of mucolytics, it is necessary to clean the thick mucus and sinus secretions by saline irrigation. This procedure is not only beneficial for patients with annoying thick mucus, but also it is especially useful for postoperative cleaning after intranasal sinus surgery.

It is necessary to emphasize to parents the need to perform nasal irrigation once or twice a day as one of the main strategies for the prevention of sinusitis, in the same way that teeth brushing prevents cavities.


Atrophic rhinitis benefits from nasal irrigation.


Atrophic rhinitis varies in severity and is difficult to cure. Saline irrigation is recommended as a very useful treatment for it.


The use of saline irrigation to eliminate harmful particles and restore normal ciliary flow is included for the correct management of nasal allergic diseases.

2. Allergic Rhinitis


A randomized clinical trial showing that nasal saline irrigation is beneficial for the treatment of asthma and allergic rhinitis in children.


Review of 14 studies including children and adults: Saline irrigation may reduce patient-reported disease severity compared with no saline irrigation at up to three months in both adults and children with allergic rhinitis, with no reported adverse effects.

Nasal saline douching appears to be effective, being accepted and tolerated and has a significant positive impact on the quality of life in children with allergic rhinitis.


Among recommended treatments, non-pharmacological therapies such as nasal irrigation are included.


Nasal saline irrigation improves the effectiveness of intranasal corticosteroids alone in children with allergic rhinitis and is proposed as an adjunctive therapy.


Large-volume, low–positive pressure nasal irrigation with isotonic saline is an effective adjunctive therapy to improve quality of life in patients with allergic rhinitis already on intranasal corticosteroid therapy.


Nasal irrigation, apart from being convenient and inexpensive, is effective to control the symptoms of seasonal allergic rhinitis in the adult patient.


Nasal saline irrigation improves the quality of life in pediatric rhinoconjunctivitis and is effective as a co-adjuvant treatment in acute sinusitis in atopic children.

Isotonic saline nasal irrigation may be recommended as a complementary therapy in allergic rhinitis. It is well-tolerated, inexpensive and easy to use.


Saline irrigation is effective, cheap, safe, well-tolerated and easily accepted by children with grass pollen-mediated allergic rhinitis. Thus, it could be included among therapies recommended for this pathology.


Nasal irrigation with hypertonic saline results in improved symptom score, nasal saccharin transit time and quality of life, compared to normal saline, in children with symptomatic allergic rhinitis.


Nasal irrigation is a good treatment for allergic rhinitis. It allows to control rhinitis with reduced administration of topical corticosteroids.


Nasal irrigation during the pollen season improves symptoms and reduces the use of antihistamines in children with allergic rhinoconjunctivitis.


Saline irrigation with isotonic or hypertonic solutions improves symptoms during the pollen season.

Saline irrigation is effective for the treatment of allergic rhinitis.


Saline irrigation with hypertonic solutions during the pollen season reduces symptoms and medication consumption.

Inhibition of the Seasonal IgE Increase to Dactylis glomerata by Daily Sodium Chloride Nasal-sinus Irrigation During the Grass Pollen Season. Subiza JL, Subiza J, Barjau MC, Rodríguez R, Gavilán MJ. *Journal of Allergy and Clinical Immunology* (1999), 104:711.

Saline irrigation of the nose and paranasal sinuses during the flowering season inhibits the IgE-mediated response to grass pollens.


Nasal irrigation is important in the treatment of allergic rhinosinusitis.


Saline irrigation significantly reduces inflammatory mediators present in patients with perennial allergic rhinitis. This decrease is maintained up to six hours after irrigation.


All forms of allergic rhinitis benefit from saline irrigation.
3. Mucociliary clearance


Nasal lavages with saline solution improve mucociliary clearance as measured by saccharin test. Temperature is relevant, with 37º C nasal lavages providing the highest benefit.


Increased mucociliary clearance in response to hyperosmolar saline may help eliminate accumulated secretions in the airways and prevent respiratory tract infections.


Sinonasal irrigation with isotonic solutions improves mucociliary function in allergic rhinitis and acute sinusitis. Otherwise, hypertonic solutions improve this function in chronic sinusitis.


Irrigation with Ringer’s solution (SinuSalt) results in a faster recovery of mucociliary function in operated patients than irrigation with physiological saline.


The importance of saline irrigation to recover mucociliary clearance in patients with acute or chronic sinusitis is emphasized.


Cough, wheezing and other respiratory symptoms can be significantly improved by performing pulsatile saline irrigation. Thanks to the irrigation, the purulent secretions of the sinuses can be quickly eliminated, thus preventing infection reaching to the lungs and improving the ciliary function.

The saccharin test allows an objective measurement of mucociliary function, one of the most important parts in the defense of the respiratory system. Thanks to this test, many dilemmas have been solved. Saccharin test reflects both nasal and thoracic aspects, issues that are improved by saline irrigation.


Nasal irrigation improves mucociliary clearance, both in normal individuals and subjects affected by cystic fibrosis.


Many harmful substances such as smog, pollution, chlorine, chromium, etc. can block mucociliary clearance. In turn, the deterioration of the physiological ciliary activity can delay the recovery from sinus diseases. Nasal irrigation with saline solution is an important aid to achieve a more quickly recovery of the normal ciliary activity.


Once thick secretions and bacteria have been removed, the ciliary function can be recovered.


An increasing number of environmental factors produce ciliostasis, decreasing or blocking the function of the nasal cilia. Nasal irrigation restores mucociliary clearance in most cases as reflected by the saccharin test.

It is an objective test to measure mucociliary clearance. It is useful to assess the ciliary function, before and after the treatment with nasal irrigation, in order to quantify the degree of improvement.

4. Nasal surgery


Based on the current limited evidence, nasal irrigation is an effective therapy for chronic rhinosinusitis patients after functional endoscopic sinus surgery. However, when comparing various solutions with normal saline, no significant difference was found in symptom or endoscopic scores.


Postoperative lavage of the paranasal sinus is a recognized adjuvant in the treatment of chronic rhinosinusitis. It allows the association of topical medications that can be carried to the paranasal sinuses along with the saline, increasing the reach of these drugs. Among different options, it is preferable to use high-volume nasal irrigations through squeeze bottles.


Nasal irrigation improves symptom score after endoscopic sinus surgery in patients with chronic rhinosinusitis with nasal polyps.


There are no significant differences in subjective symptoms related to sinonasal disease between the use of surfactant and hypertonic saline irrigation. However, there were more patients who reported side effects with surfactant (20% withdrawal), in comparison with none of those who used the saline irrigation.

Low pressure, large volume saline irrigation is recommended as an effective, easy to use and well-tolerated strategy for sinonasal endoscopic cleaning in the immediate postoperative period after nasoasinosal endoscopic surgery.


Saline irrigation reduces nasal secretions and improves edema during the healing phase after endoscopic surgery, displaying an anti-inflammatory role. There is a high level of evidence and it is recommended as a treatment in chronic rhinosinusitis.

**The impact of intraoperative saline irrigations on bacterial load within the maxillary sinus.** Seiberling KA. Int Forum Allergy Rhinol (2011), 351:5.

Intraoperative saline irrigations are able to significantly reduce the amount of potentially pathogenic bacteria within the diseased sinus mucosa.


Nasal irrigation reduces nasal discharge and can improve edema during the healing phase after endoscopic sinus surgery, likely mediated by an anti-inflammatory effect. There are no long-term adverse effects.


Endoscopic surgery improves the irrigation of the paranasal sinuses with positive pressure irrigation systems (Sinusalt). Otherwise, pressurized spray systems reach little more than the nasal cavity.

**Effects of buffered 2.3%, buffered 0.9%, and non-buffered 0.9% irrigation solutions on nasal mucosa after septoplasty.** Süslü N, Bajin MD, Süslü AE, Öğretmenoğlu O. Eur Arch Otorhinolaryngol. (2008).
Hypertonic solutions used after endonasal surgery are beneficial for improving mucociliary clearance and postoperative decongestion.


Sinonasal irrigation reduce the healing time and facilitate the removal of scabs after endoscopic surgery, having a high degree of acceptance in patients.


Saline irrigation should be done 1 to 3 times a day after endoscopic sinus surgery for enough time to obtain the expected clinical benefits.


Nasal irrigation is effective for postoperative treatment of sinusitis in cystic fibrosis, reducing recurrences and the need for new surgery.


Before surgery, saline irrigation is recommended to reduce infection, and after surgery, to restore ciliary function and decrease patient symptoms.


Saline irrigation is very effective to avoid crusting after nasal surgery.
5. Irrigation vs. Nebulization/Sprays


In chronic rhinosinusitis disease, the use of corticosteroid delivered by nasal irrigation is superior to simple nasal spray in postsurgical patients.


The use of a squeezable bottle for nasal irrigation in children with acute sinusitis was associated with further improvements in sinus symptoms and satisfaction scores compared to syringe use.


Authors review influence of devices, methods, and patient head position on nasal and paranasal sinus drug delivery.


Clinical trial showing that, while nasal irrigation resulted in reduced overall symptom burden, headache, use of over-the-counter medications and the perceived need to consult primary care physicians in future episodes, steam inhalation had no consistent benefits in chronic sinus symptoms.

There is a relative effect of nasal saline irrigation and nasal saline spray on subjective symptom improvement in chronic rhinosinusitis.

**Comparison of nasal sprays and irrigations in the delivery of topical agents to the olfactory mucosa.** Lam K. Laryngoscope (2013).

Compared to aerosols, nasal irrigation provides a more effective method of administering topical agents to the nasal cavity. The complete distribution of the irrigation has important clinical implications for improved administration of therapeutic agents to the olfactory mucosa.


Small volume nasal spray or nasal irrigation (40 mL) is not able to enter the sinuses in patients with chronic sinusitis.


Nasal irrigation performed with large volumes of irrigation fluid is more effective than pressurized sprays for the treatment of sinonasal symptoms.


Nebulization with bacitracin / colimycin is not effective for the treatment of chronic rhinosinusitis.


Positive pressure nasal irrigation (SinuSalt) is more effective than nasal sprays or nebulizations to distribute the irrigation solution in the maxillary sinuses and in the frontal recess. This should be the method of choice for the irrigation of these areas.

Three methods of nasal irrigation are compared: positive pressure irrigation, negative pressure irrigation (sniffing) and irrigation by nebulization. Among them, the positive irrigation (SinuSalt) is the best one in guaranteeing irrigation to the paranasal sinuses, existing a great difference with nebulizations, whose access to the sinuses is very poor.


Nasal irrigation is the treatment of choice to decontaminate the nasal cavities from radioactive products, irritants, dust, and pollution in general. Different sinonasal irrigation methods are reviewed.

6. Xylitol


Xylitol nasal irrigation is useful in postoperative endoscopic sinus surgery and septoplasty care, beyond the benefit provided by normal saline irrigation alone.


Xylitol nasal irrigation results in greater improvement of symptoms in chronic rhinosinusitis and greater enhancement of nasal nitric oxide in maxillary sinus, as compared to saline nasal irrigation alone.


Saline irrigation can improve the symptoms of sinonasal disease and may improve outcomes in certain contexts. The use of xylitol in chronic rhinosinusitis seems to be promising.

Xylitol has been shown to reduce nasal bacterial carriage, otitis media and cavities *in vivo*. Diluted in water, it is a well-tolerated agent for sinonasal irrigation, reducing more efficiently the symptoms of chronic rhinosinusitis compared to saline irrigation alone.


The irrigation with xylitol generates a great improvement of chronic rhinosinusitis symptoms in comparison with saline irrigation alone.

**In vitro susceptibility of established biofilms composed of a clinical wound isolate of Pseudomonas aeruginosa treated with lactoferrin and xylitol** Mary Cloud B. Ammons. *International Journal of Antimicrobial Agents* (2009), 230:236.

The combined treatment of lactoferrin and xylitol *in vitro* effectively reduces the viability of *Pseudomonas aeruginosa* isolated from a wound.


Xylitol is an authorized additive in processed and unprocessed fishes, mollusks, fish roes and crustaceans.

**Ministerio de Sanidad, Política Social e Igualdad, BOE nº 219 de septiembre de 2011 sobre la lucha contra el dopaje en el Deporte.**

It states that Xylitol is an authorized product in sport first aid kits.


It determines that Xylitol is an additive allowed for food use.

Xylitol reduces experimental sinusitis when administered simultaneously with bacteria. It may have a role in nasal irrigations for the treatment of human diseases.


Xylitol, commonly used as food sweetener, seems to offer a possibility to prevent acute otitis media in children, therefore reducing the need for antimicrobial agents.


Xylitol on the surface of the respiratory tract can improve the innate antibacterial defense and could prevent or delay the onset of bacterial infections in cystic fibrosis patients.


Xylitol in chewing gum reduces acute attacks of otitis media by 50%.


Xylitol reduces the growth of *Streptococcus pneumoniae* and *S. mitis*, and could reduce the transport of bacteria, having therefore a clinical importance in the prevention of pneumococcal diseases.

Xylitol Nasal Irrigation in the Management of Chronic Rhinosinusitis. Joshua D. Department of Otolaryngology – Head and Neck Surgery Stanford University School of Medicine.

Xylitol is a safe, well-tolerated sinonasal irrigant when mixed with water in a 5% weight / volume formulation.
7. Miscellaneous


In this pilot study, hypertonic saline nasal irrigation and gargling significantly reduced the duration of upper respiratory tract infections, over-the-counter medications use and illness within the household.

Budesonide irrigation with olfactory training improves outcomes compared with olfactory training alone in patients with olfactory loss. Nguyen TP, Patel ZM. Int Forum Allergy Rhinol. (2018);00:1–5.

Adding budesonide irrigation to olfactory training significantly improved olfactory ability, compared with olfactory training plus saline irrigation.


Multiple factors are associated with patient compliance with nasal saline irrigation after functional endoscopic sinus surgery.


Given the potential risk of bottle and irrigant microbial contamination, various approaches for decontamination have been tested and are reviewed.


The present review of the evidence-based literature sought objective arguments for optimization and efficacy of nasal irrigation.

The study shows that nasal irrigation is necessary for patients with nasopharyngeal carcinoma for a high quality of life in terms of nasal sinusitis.


93% of the children included in the study used nasal saline irrigation and reported symptomatic improvement. Only 28% of parents thought it would be a tolerated treatment by the child. As conclusion, the biggest obstacle to nasal irrigation in children is parents reluctance, showing that regardless of age, the children were judged by the parents.


This systematic review indicates that antibiotics used topically in nasal irrigation (not in nasal spray) are effective in the treatment of chronic rhinosinusitis.


Nasal irrigation with 0.5% mupirocin is effective for post-surgical treatment of chronic recalcitrant rhinosinusitis.


Sinonasal irrigation is a safe and effective method to reduce post-irradiation rhinosinusitis.


Nasal irrigation with antimicrobials is a potential effective treatment for the growing group of patients who remain symptomatic after appropriate medical and surgical treatment.

Saline irrigation with hot water is an effective method to reduce posterior nasal hemorrhages.


Saline irrigation with hot water is more effective, less painful and less traumatic to the nose than closing the nostrils for the treatment of posterior nosebleeds. Irrigation also requires a significantly shorter hospitalization time.


The rhinorrhea associated with the common cold leads to a mucoid secretion with infiltration of neutrophils that facilitates bacterial superinfection after some days. Therefore, the elimination of these thick secretions is convenient to reduce superinfections.


Nasal irrigation improved nasal symptoms (obstruction, retronasal secretion, irritation and itching) in workers exposed to sawdust. It also significantly improved peak nasal expiratory flow and mucociliary clearance time.

8. Nasal irrigation as vehicle for other drugs and treatments


Nasal irrigation improved the prognosis of chronic rhinosinusitis patients after endoscopic sinus surgery. Budesonide nasal irrigation had a better effect than normal saline nasal irrigation.

This study shows that budesonide in saline nasal lavage results in clinically meaningful benefits beyond the benefits of saline alone for patients with chronic rhinosinusitis.


In chronic rhinosinusitis disease, the use of corticosteroid delivered by nasal irrigation is superior to simple nasal spray in postsurgical patients.


Continued use of betamethasone nasal irrigation remains a viable and safe treatment option for chronic rhinosinusitis patients following functional endoscopic sinus surgery.


Although steroid nasal irrigation does not induce adverse events, the beneficial effects of additional steroids in saline irrigation were ambiguous compared with saline irrigation alone. Authors state that further clinical trials are needed.


Nasal irrigation with budesonide is an effective postoperative treatment for chronic rhinosinusitis with asthma, reducing the oral steroid intake.


Chronic rhinosinusitis patients who are recalcitrant to conventional medical and surgical therapies, can benefit from therapies centered on anti-infective and anti-inflammatory nasal irrigations.

High-volume corticosteroid nasal irrigations are a good option in difficult-to-treat chronic rhinosinusitis control of disease, reaching 81.3% success control and significant improvement.


Nasal irrigation with low-pressure, high-volume nasal saline irrigation during the early postoperative period following septoplasty is an effective method, resulting in increased patient satisfaction, nasal air flow and decreased edema and crust formation.


In this study, including ninety-one pediatric patients with acute rhinosinusitis, low pressure nasal saline plus fluticasone propionate is faster than antibiotherapy and nasal decongestant in improving clinical symptoms.


Devices and pharmaceutical agents to apply topical medical therapy to the sinuses are reviewed. Drug addition to large-volume, low-pressure nasal irrigation can be an effective option for the management of chronic rhinosinusitis.

*of interest

**outstanding interest